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ABSTRACT

By 1973 there were very great disparities between the opportunities for education in the urban and rural areas of Afghanistan. This case study concerns provincial school construction programs for hundreds of small buildings in the remotest areas of what is one of the most mountainous countries of the world. A study proposed alternative building designs based on the use of local, rural materials modified for improved performance and made more resistant to earthquakes. A number of prototypes were built. Two building projects were initiated. The United States Agency for International Development (USAID) financed 45 schools built by contractors employed by the government. The World Food Programme (WFP) provided food for work on 320 school buildings designed in cooperation with the government. The WFP project involved enlisting the support of the villagers, and construction was the responsibility of a small local group at each site. Although the buildings constructed under both programs were identical in design, the approaches to the organization of their construction were fundamentally different. Among the lessons learned is that if local practices are to be used in construction, they must be modified with great caution, and preferably in consultation with those responsible for doing the work. (Author/MLF)

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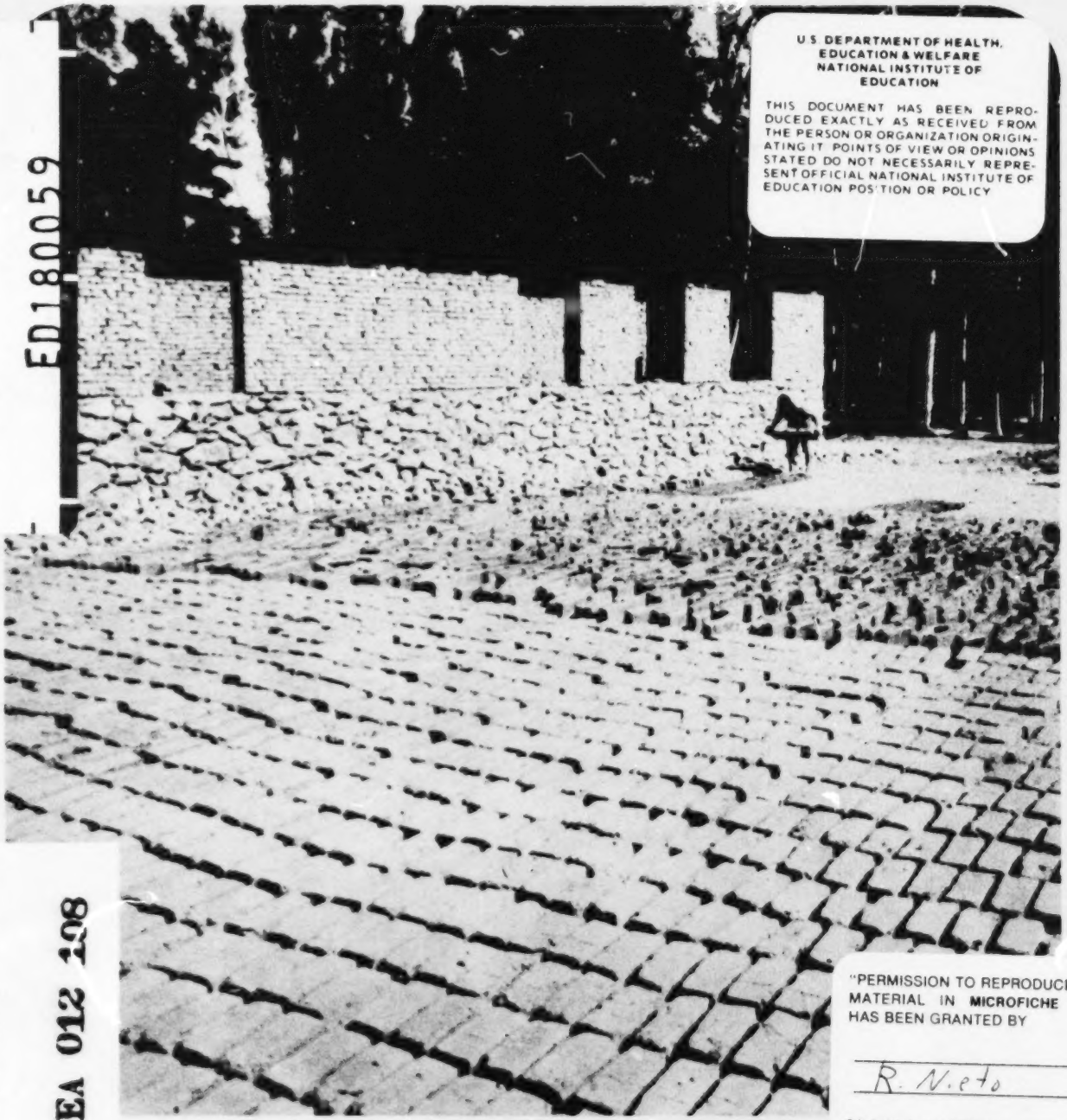

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– a Case Study

by Fazel Ahmad

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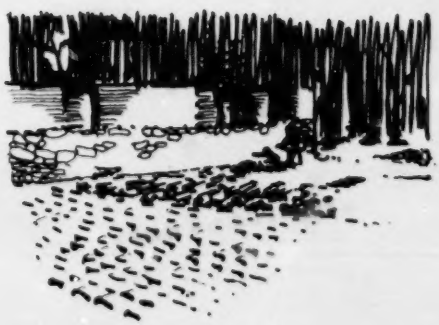

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Chapter One

PRIMARY EDUCATION IN THE REPUBLIC OF AFGHANISTAN

In 1973, the World Food Programme authorities indicated willingness to provide food for work in a multi-purpose project, designed in co-operation with the Government to assist in the process of integrated rural development in the Republic of Afghanistan (Figure 1). The project included the construction of rural roads, bridges and irrigation canals, clinics and community centres. It also included the construction of rural elementary schools, teachers' houses and school toilets.

At that time, primary education in rural Afghanistan was provided for in two types of institutions. In the larger villages and towns, children attended primary schools offering six years of education, after which they were eligible to attend secondary school or 'lycée', as it is known here. In the smaller villages or at locations between villages, children attended village schools with from one to three teachers offering from three to six years of elementary education which was usually terminal unless the child could subsequently manage to move to an area supporting a primary school.

Figure 1. Map of the Republic of Afghanistan

By 1973, the teacher training colleges around the country were producing increasing numbers of trained primary school teachers and work was well advanced in the preparation of a new primary school curriculum and of the necessary textbooks. These efforts were however not matched by plans to change and develop the physical facilities in which the improved educational system would be implemented.

Most fortunate were the children attending primary school in the large towns for, although some of the schools were located in rented houses with small rooms, a large number were in permanent school buildings designed as such (Plate 1).

Plate 1. An urban primary school

The situation in the rural areas was very different. Most rural schools were housed in small buildings rented from well-to-do villagers, or accommodation was found in the garden or entrance to the village mosque (Plate 2). Sometimes the villagers themselves has contributed to provide a small school but the condition of these buildings which, lacking maintenance, was often totally unsatisfactory.

"The existing rural schools are nearly all built with mud walls 70-80 cm-thick using sun dried bricks or adobe, except in certain hilly areas where 70-80 cm-thick random rubble stone in mud mortar has also been used (Plate 3).

The foundations are invariably of stone masonry in mud mortar. The roofs consist of all types of warped and crooked pole rafters supporting timber planks, scantlings or even matting, finally covered with 30-40 cm ... of mud in two layers (Plate 4). In many cases the rafters are directly resting over the mud walls and wall plates are missing. These roofs had mostly sagged, resulting in water leaking into the classroom; they also ... in a few cases, collapsed"(Plate 5).[1]

1. Unesco. Regional Office for Education in Asia, Bangkok. *Primary and village school buildings and teachers' houses. An interim report to H.E. the Minister of Education of the Republic of Afghanistan.* Bangkok, 1973.

Plate 2. A village school in a mosque garden

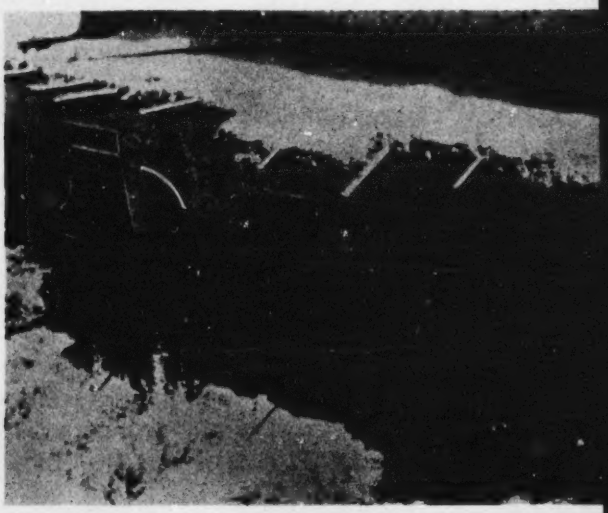

Plate 3. A village school built by the community and in a state of disrepair

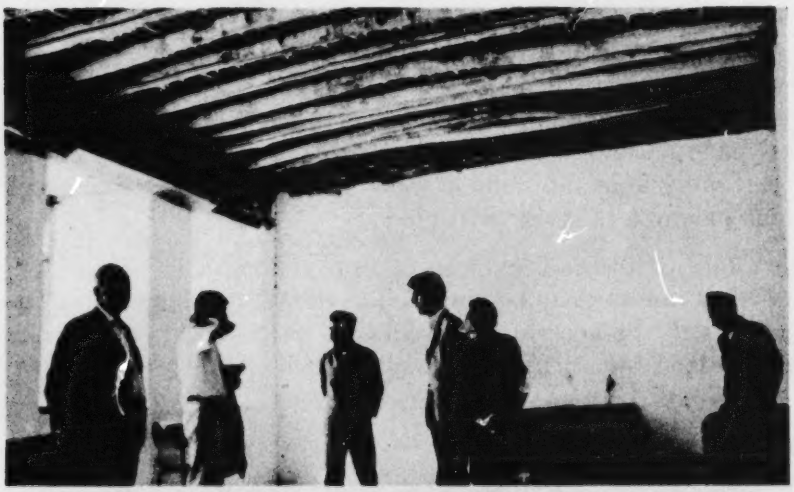

Plate 4.
Typical roof of a village school

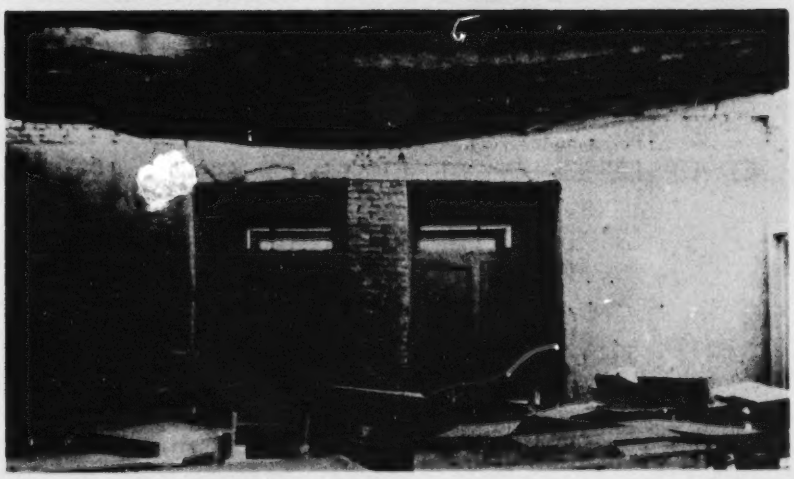

Plate 5.
The combined effects of snow, rain and lack of maintenance on the roof of a village school

There was thus, at the time the WFP project was planned, an urgent need for new school buildings to match the developments taking place in primary education itself. The increase in the number of young teachers from the training colleges also posed the problem of housing. Clearly teachers could not be sent to the rural areas unless they could find a place to live and the solution usually adopted - that of living in the school store or in a classroom - was obviously unsuitable. The inclusion of teachers' housing in the WFP project was thus an essential part of the plan to develop primary education. Nor was health forgotten, for every school was to be provided with toilet facilities and a well.

In planning to provide a complete set of buildings comprising school building, teachers' housing and toilet facilities, the Republic of Afghanistan became in 1973 one of the first countries in the Asian region to encourage teachers to work in rural rather than urban areas by providing clean and comfortable housing and good school buildings in which to teach.

The number of buildings initially planned under the WFP project (450 primary, 450 village schools and 600 teachers' houses) by no means met the total need, but was enough to help in carrying out the Government's plans for primary education.

In 1974, the Government introduced substantial reforms in the education system. These included the abolition of the three-to-six-year village schools and the establishment of a uniform system of primary education for the whole country. Furthermore, the duration of education in primary school was increased from six to eight years. Figures 2 and 3 illustrate the old and new educational structures. Accompanying the reform was an extended primary school curriculum, an outline of which is given in Table 1.[2]

An immediate effect of the introduction of this reform was on the total number of primary school buildings to be built under the WFP programme. This, because of the increase in the number of classrooms in each school from six to eight, resulted in a revision of the project to construct 600 primary schools with teachers' quarters and toilets.

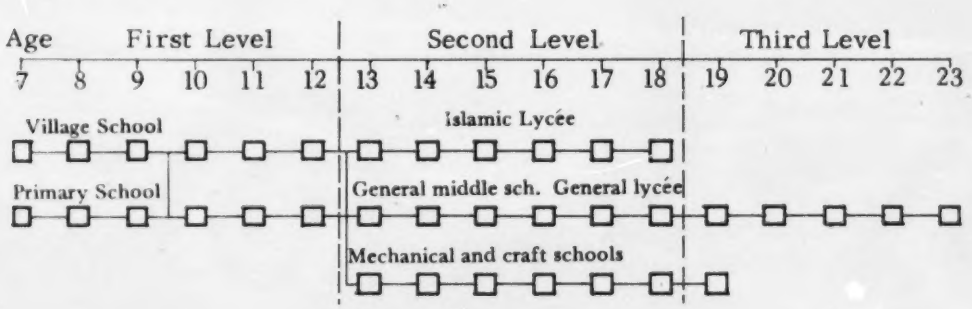

Figure 2. The structure of education in Afghanistan before the education reform

2. Republic of Afghanistan. Ministry of Education. *General objectives of the Republic of Afghanistan for Education and Training.* Kabul, 1973. mimeo.

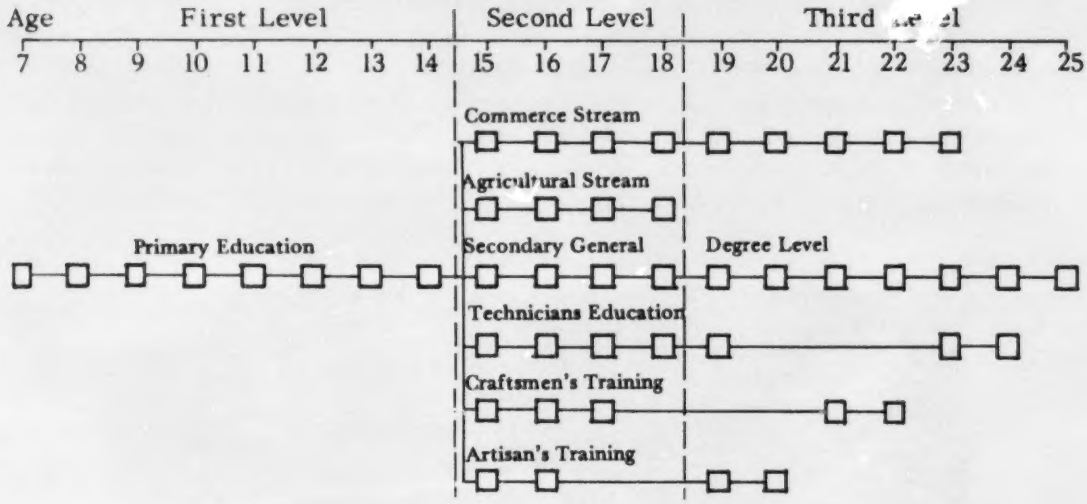

Figure 3. The present structure of education in Afghanistan, after the education reform

Table 1. Subject areas and periods taught - from the primary school curriculum 1977

Subject	Grade	Periods / Week							
		I	II	III	IV	V	VI	VII	VIII
Theology		4	4	4	4	4	4	3	3
1st language		18	18	18	6	6	6	6	6
2nd language		-	-	-	5	5	5	5	5
Arithmetic		5	5	5	5	5	5	5	5
Social sciences		-	-	-	5	5	4	3	3
Afghan society		-	-	-	-	-	-	2	2
Science and health		-	-	-	5	5	4	-	-
Science		-	-	-	-	-	-	4	4
Foreign language		-	-	-	-	-	2	3	3
Art and simple craft		3	3	3	4	4	4	-	-
Craft		-	-	-	-	-	-	4	4
Physical education		25* min	25* min	25* min	2	2	2	2	2
Total		30	30	30	36	36	36	36	36

* 25 min. per each day

Notes: 1. Duration of a period in summer is 40 min and in winter 35 min.
2. Grades I, II and III are each taught by a separate teacher - some single teacher situation.

The teaching staff in a rural primary school is comprised of eight teachers and one head teacher. In most rural schools the teachers are men but in schools in the larger villages, there are women teachers too (Plate 6). Accommodation is a major problem except where the teachers are assigned to their home villages. It is difficult for either men or women to rent accommodation in a strange village and while the male teacher may be willing to live in the school or in the teachers' quarters attached to the school, this would be unacceptable for a female teacher.

Plate 6. The village school teacher

As to the children who form the focus of the whole endeavour (Plate 7), they should, as is shown in Figure 3, enter primary school at age of six or seven years. Some, however, may enter a year or two later and it is thus common to find the average age of a class somewhat higher than might be expected.

Plate 7. The children

All of those entering grade I do not of course remain in the school until grade VIII. Statistics show that if there are 40 children in grade I, then the succeeding grades will have: 31, 28, 25, 19 and 15 children respectively. This was the national pattern in 1971 and it was not significantly different from that in 1966.[3]

There are also differences between the enrolment, which is recorded in the school register on the first day of the school year, and the actual attendance. From a sample of 11 rural village and primary school enrolments recorded in 1973 and summarized in Table 2, it will be seen that daily attendance differs often quite sharply from enrolment.[4]

Table 2. Attendance (on selected days) compared with enrolment in 11 village and primary schools in 1973

Place	Enrolled	In attendance	per cent attendance of enrolment
Zabul	146	92	63
Balkh	85	65	76
Bamyan	63	36	57
Bamyan	65	41	63
Bamyan	117	96	82
Bamyan	233	192	82
Parwan	179	159	88
Parwan	249	203	81
Kunar	220	188	85
Kunar	88	52	59
Kunar	94	79	84

Source: Primary and village school buildings and teachers' houses, p. 96-98.

The position in relation to retention rates and daily attendance is mentioned at some length here as these factors have an important bearing, not only on the understanding of the status of primary education in the Republic, but also because they have direct and important consequences for school building design. It would, at this stage in the development of primary education in Afghanistan, be unwise to provide school buildings which totally ignored, in respect of the number of places for which they are designed, the fact that now, and probably for some years to come, there will be substantially fewer children in grade VIII than in grade I.

With increases, both qualitative and quantitative, in the teaching force, with the introduction and continued revision of new curricula and textbooks and with students housed in better school buildings with good furniture and equipment, the standard of primary education in Afghanistan should improve greatly quite soon.

3. Republic of Afghanistan. Ministry of Education: *Educational statistics, Afghanistan 1971*. Kabul, 1972.

4. Unesco, *Primary and village school buildings and teachers' houses*, p. 96-98.

Chapter Two

THE ROLE OF THE EDUCATION MINISTRY IN SCHOOL BUILDING DESIGN AND CONSTRUCTION BEFORE 1973

The role of the Education Ministry in respect of school building design and construction in the Republic of Afghanistan is perhaps unique in the countries of the Asian region. In its long history, Afghanistan never fell to colonial powers and was thus able to develop its institutions in its own way. This was certainly the case in respect of the organization for school building which has important consequences for the developments that took place after 1973 and is the subject of this Educational Building Report.

Prior to 1973, the construction of school buildings was, like other public buildings in Afghanistan, the responsibility of the Ministry of Public Works. The arrangement was unique, however, for two reasons. First, while the Public Works Ministry was indeed responsible for construction, the responsibility for design, production of working drawings, preliminary estimates and specifications of all schools in the country was vested in the Construction Department of the Education Ministry.

Second, the Education Ministry, through its Construction Department, was solely responsible for the design and construction, as well as the maintenance, of all school buildings within the area of the capital city, Kabul.

The effects of this arrangement were of some interest. Because for the rural areas the staff of the Construction Department was confined to a role of designing, there was neither the understanding nor experience of the very different problems of building in the diverse rural areas of the country. This, in turn, meant that the drawings of design sent, through the Provincial Directorate of Education to the Public Works Department for the construction of schools outside Kabul City, were based on the assumption that materials, available skills and building conditions were likely to be the same as those found in Kabul. This was of course not so and, as the years passed, many schools were started in various parts of Afghanistan which it proved impossible to finish (Plates 8 and 9).

Coupled with this situation was the fact that the Public Works Department in the pre-1973 period was normally only able to deal with the larger public buildings in the national construction programme. Like many other public works departments in the countries of the Asian region, it had neither the staff nor the equipment to deal with a provincial school construction programme of thousands of small buildings in the remotest areas of what is one of the most mountainous

countries of the world.[1] Indeed, it was this combination of circumstances which, by 1973, had led to such an unsatisfactory state of affairs in education in Afghanistan - a situation in which there were very great disparities between the opportunities for education in the urban and rural areas.

Plate 8. An unfinished school, abandoned in Kunara

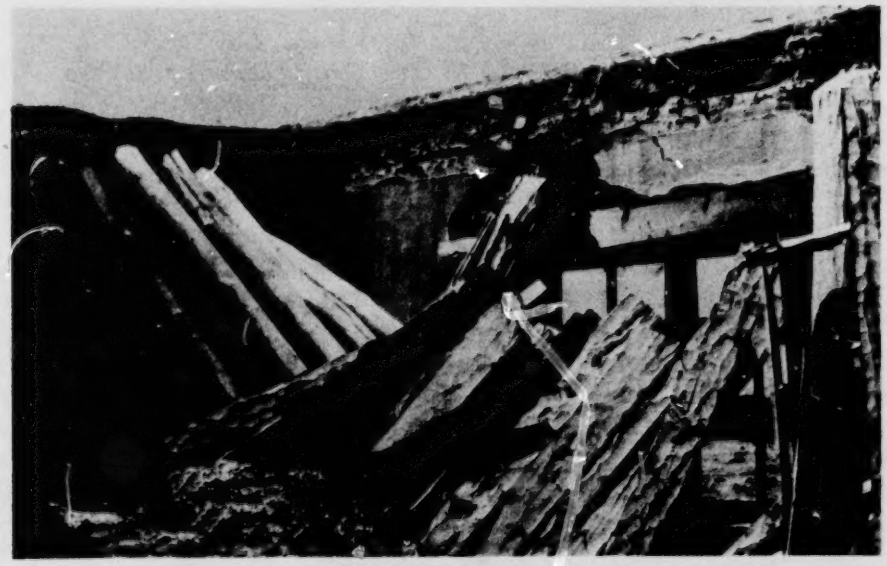

Plate 9. An attempt to use timber over the same large spans as concrete resulted in the collapse of this school at Ghazni.

1. For a description of a similar situation in Uttar Pradesh, India, see: Srivastava, R.D. *Innovation in management of primary school construction; a case study.* Bangkok, Unesco Regional Office for Education in Asia, 1974. 68 p. (Educational Building Report, 3)

But while the impact on building outside Kabul of the Education Ministry and its office of construction was less than might have been hoped, the volume and variety of work to be undertaken in the capital city had been such that, over the years the Construction Department had recruited a substantial establishment of engineers, draughtsman, technicians, supervisors and administrators. The staff strength in 1973 stood at some 160 persons organized as shown in Figure 4. Although experience of building in rural areas was lacking, it was this staff which was to form the nucleus of the organization that was to deal with the problem of constructing the larger number of rural primary schools under the WFP programme in the post-1973 period.

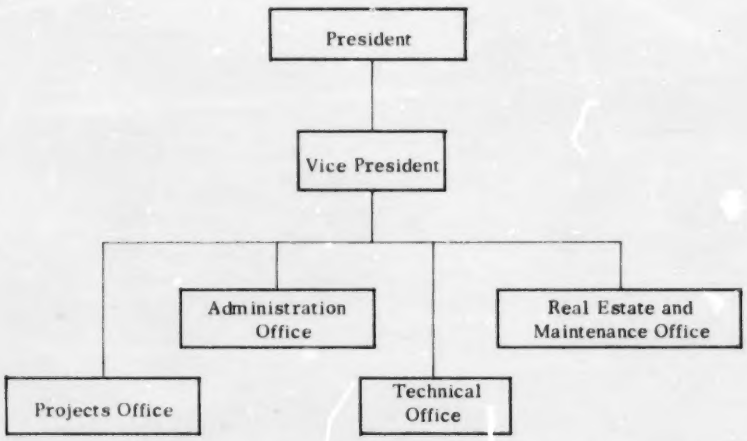

Figure 4. The organization of the office of the President of Construction in the Ministry of Education before 1973

It is appropriate to conclude this short background chapter with some explanation of the official procedures for proposing, sanctioning, contracting for and paying for school buildings built in the provinces in the period down to 1973. Figure 5 illustrates the situation. There are three basic components to the activity. First, there is a request from the Provincial Director of Education[2] which, if favourably received in the Education Ministry, the Planning Ministry and the Ministry of Finance, results in the release of funds for construction to the Education Ministry. Second, the Education Ministry provides designs for the new building to the Provincial Director of Education while, at the same time, transferring the funds for construction to the Provincial Department of Finance - another of the Departments in the office of the Governor of the Province.

The final phase of the exercise is at the provincial level where the Provincial Director of Education receives the construction funds from the Provincial Department of Finance and sends the request for construction to the Provincial Director of Public Works who arranges for the work to be carried out. The contractor is paid by the Provincial Director of Education after certification of progress by the provincial public works authority.

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2. Afghanistan is divided into Provinces of which the representative of the Government is a Governor. The Governor's office includes, *inter alia*, a Provincial Director of Education who is the most senior official responsible for education in the Province.

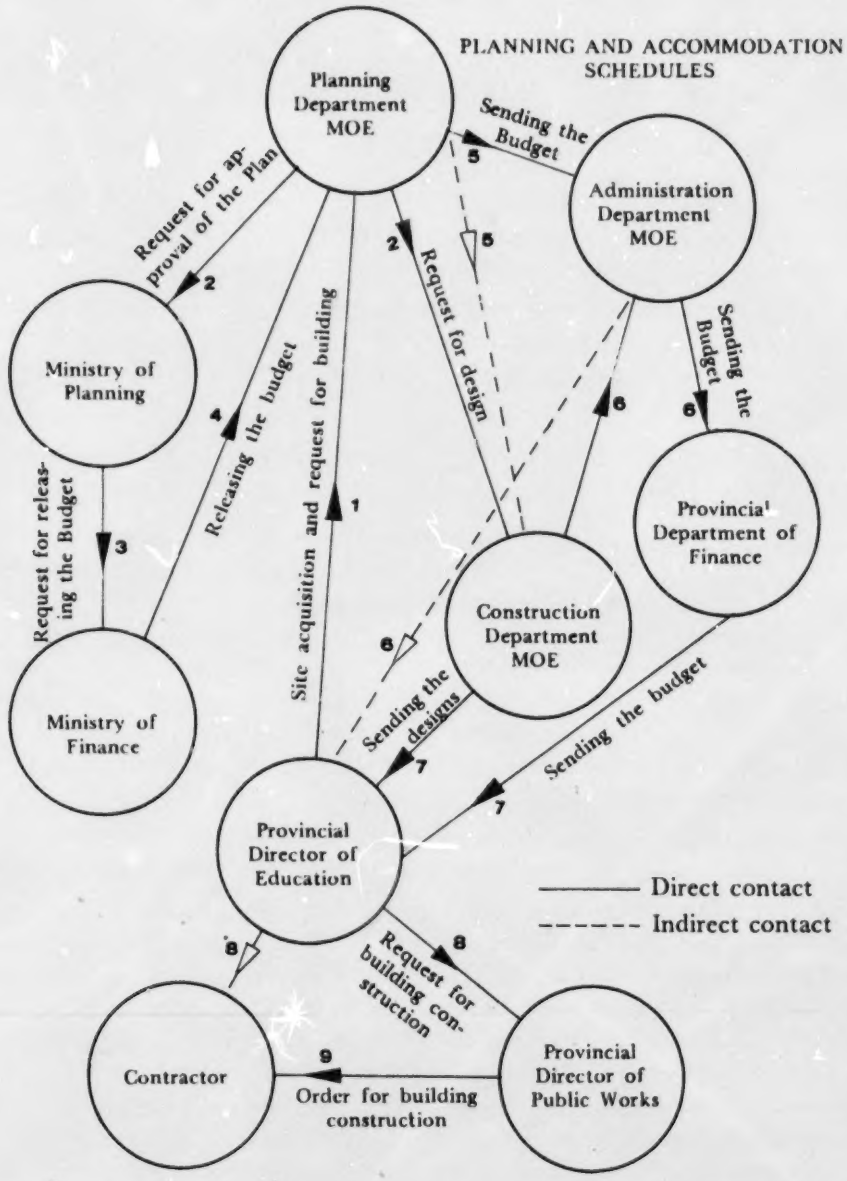


Figure 5. Procedures followed for financing of school buildings constructed under the aegis of the Public Works Department

For the construction of a large public building, such as a secondary school, where the work will require a year or more for completion, the procedures outlined above proved not too cumbersome. For a programme involving the construction of hundreds of small primary school buildings all over the country, however, they are much too complex and time-consuming. The following chapters describe how these procedures were modified to meet the new situation posed by the WFP-supported school building project.

Chapter Three

THE PRIMARY SCHOOL PROGRAMME – BUILDING DESIGNS AND COSTS AND THE CONSTRUCTION OF PROTOTYPES

In 1973, there were no official designs available for rural primary schools. This was largely because, as we have seen, that the Construction Department was primarily concerned with building in (urban) Kabul and its designs for building outside Kabul, to be executed by the Provincial Works Departments, were for larger schools, also usually to be built in or near other urban centres in Afghanistan.

The problem posed by the WFP project was thus: "What is to be built - what accommodation is needed - where and how is it to be constructed ?"

A study[1] of this problem was started towards the end of 1973 by a team of Education Ministry officials including the President of Construction and a civil engineer, assisted by Unesco consultants including an architect, a cost specialist, a soils specialist and an expert in earthquake engineering design. The work was finished quickly and a Report[2] submitted to the, then, Minister of Education proposing alternative building designs based on the use of local, rural materials, proposing methods of construction in which the traditional use of local materials be modified for improved performance and made more resistant to the earthquakes that are an intermittent problem in the country (Figure 6) and, finally, outlining the costs of the project. The designs proposed are shown in Figures 7, 8, 9 and 10,[3] and Table 3 provides a space and cost analysis.

There were three innovative aspects of the proposals. The first was that Government should invest public funds in buildings built using indigenous construction methods - that is mud brick, stone rubble or burned brick walls, as found locally, and a mud roof. The second innovation proposed was that the quality of the mud roof in respect of its ability to shed water rather than absorb it should be improved by the inclusion of a waterproof plastic membrane.[4] Third, the Report recommended simple means by which the buildings could be made more earthquake-resistant.

---

1. Unesco. Regional Office for Education in Asia. /Team of School Building Specialists/ *Primary and village school buildings and teachers' houses.*

2. *Ibid.*

3. It will be recalled that the study was made *before* the Education reforms, described in Chapter One, were introduced. The reforms abolished the village schools and substituted primary schools with eight instead of six grades.

4. Mud, which is the only available material for roofing in most of rural Afghanistan, is an excellent thermal insulator in a climate characterized by extremes of temperature. However, in the rainy season, it retains water, increases density and is often the cause of collapse of the poplar poles used for support.

The Report was accepted by the Education Minister and Unicef agreed to contribute the sum of sixteen thousand US dollars towards the construction of prototypes. Shortly afterward the Afghan Mille Bank agreed to finance the construction of a further 20 prototypes in Badakshan, one of Afghanistan's most mountainous Provinces.[5]

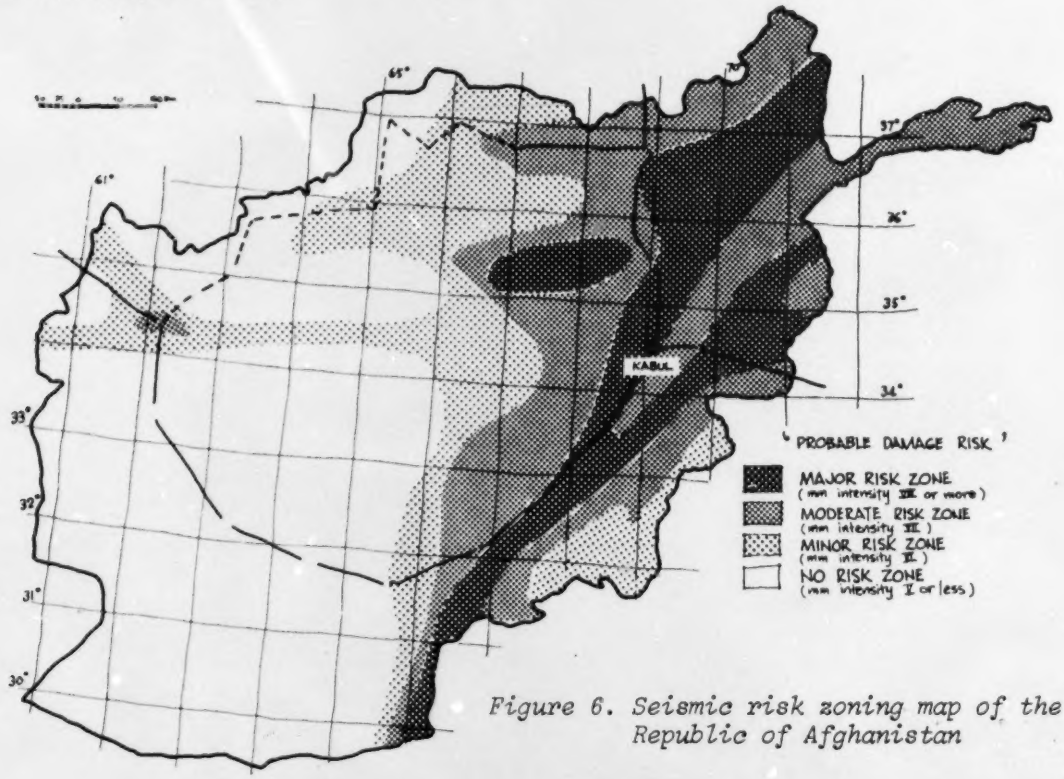


Figure 6. Seismic risk zoning map of the Republic of Afghanistan

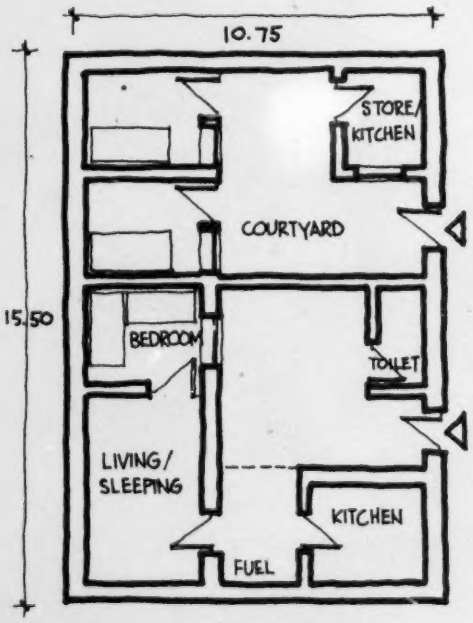


Figure 7. Teachers' housing - initial design

5. Badakshan is the home of the Marco Polo sheep (Ovis polii) and numbers among its peaks several over 6,100 metres in elevation.

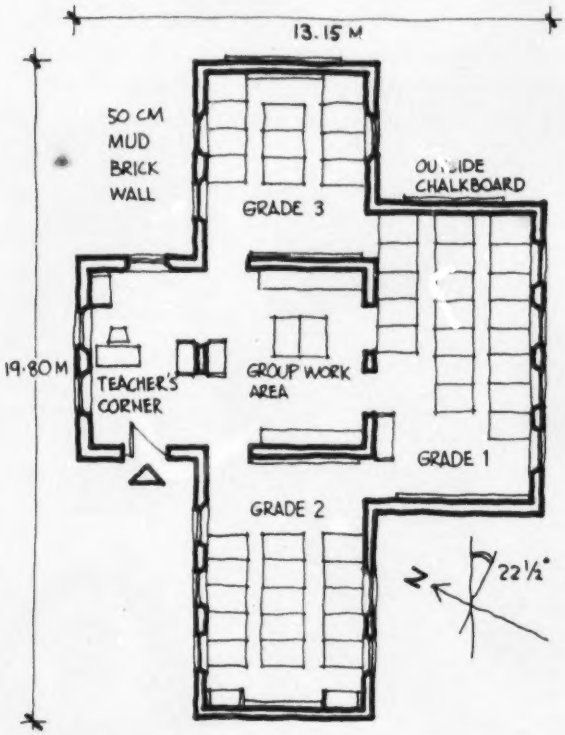


Figure 8.

Village school - alternative 1 - initial design

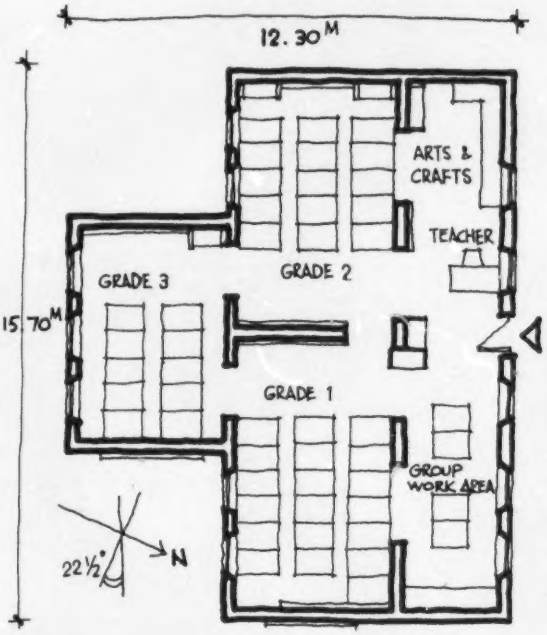


Figure 9.

Village school - alternative 2 - initial design

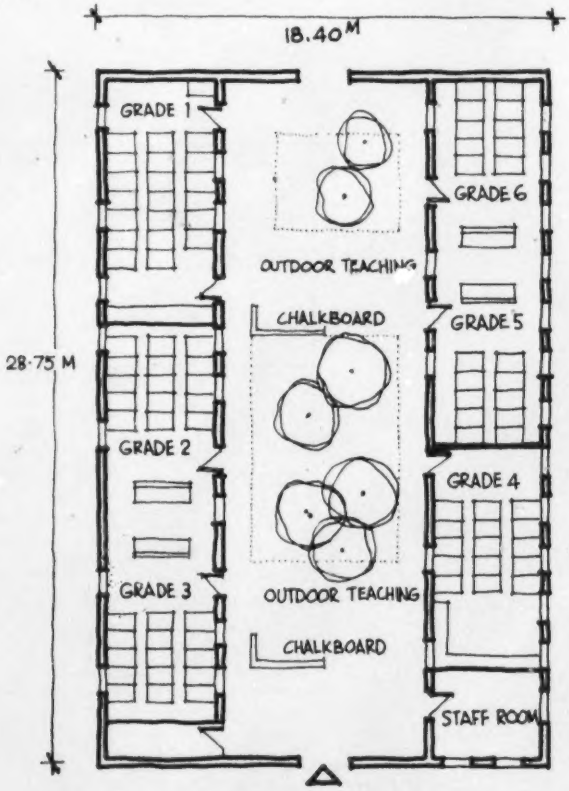


Figure 10.

Rural primary school - initial design

Table 3. Analysis of costs and areas of buildings proposed in the 1973 report

	Village schools		Rural primary schools		Teachers housing
	Scheme 1	Scheme 2	Scheme 1	Scheme 2	
No. of places	92	90	170	184	
Cost per place Afs.	1,188	1,224	1,272	1,203	
Total net area m^2	122	127	227	244	
Net area per place	1.32	1.41	1.33	1.32	
Cost Afs. m^3	188	194	200	191	225
% material/labour	64:36	64:36	64:36	64:36	64:36
Total cost Afs.	109,300	110,200	216,200	221,400	82,300
Estimate in WFP proposal	80,000	80,000	200,000	200,000	

Work on all prototypes started in 1974 and in the short construction period,[6] good progress was made. By 1975 the entire prototype project was completed and the schools were occupied. Two important conclusions emerged at the end of this phase concerning construction and management and a third concerning the siting and size of schools. All have had an impact on the main programmes that followed and which form the subject of subsequent chapters.

As far as construction was concerned, it was very clearly shown that local skills and local materials were thoroughly suitable for rural school building. Even the two small reinforced-concrete ring beams, introduced to increase earthquake resistance (Plate 10) proved easy to construct, and the introduction of a plastic waterproof membrane in the roofs appeared to present no difficulties (Figure 11). Local masons, where the walls were in stone, were also easily able to accept the 'bond stone' concept (Figure 12) which was another feature designed to improve earthquake resistance.

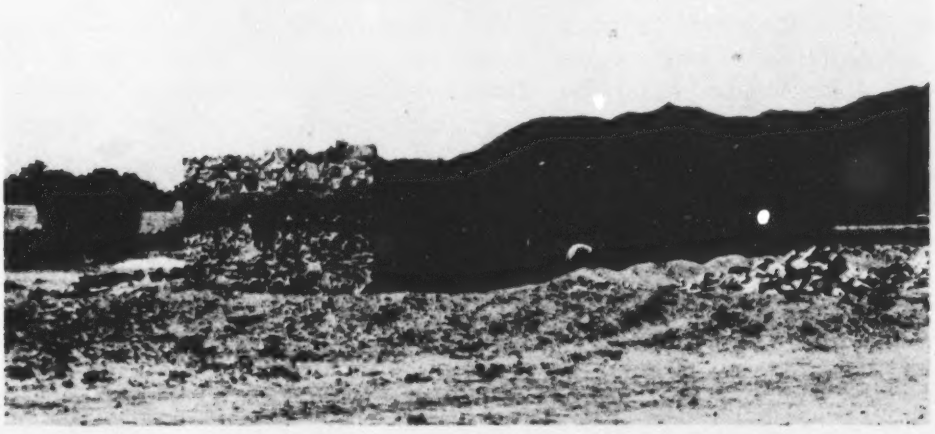


Plate 10. Earthquake resistance is improved by the inclusion of two small reinforced concrete ring beams in this school in a remote area of Nangarhar Province near the border with Pakistan.

6. Much of the country is under snow from November to March and a six-month construction period is the annual norm.

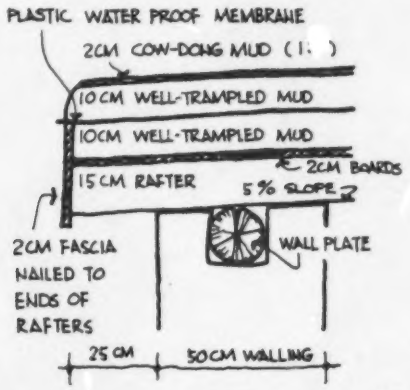


Figure 11. Use of a plastic sheet as a waterproofing membrane in mud roofs

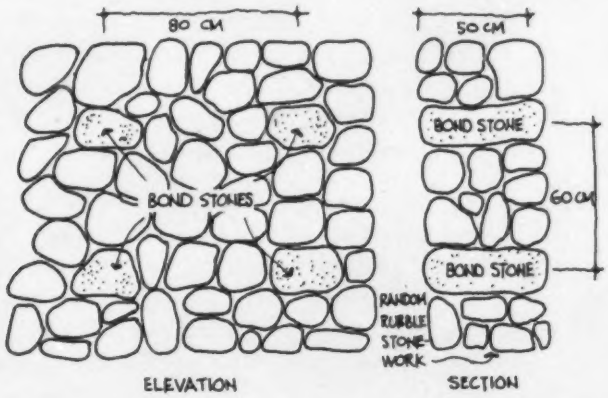


Figure 12. Bond stones tie the outer skins of the wall together to improve earthquake resistance

If any doubts were harboured, they concerned the plastic membrane. This element contrived to give trouble, largely because of lack of familiarity with jointing techniques and failure to adhere to the original design which was based on local practice in the construction of eaves.

That the prototype school programme proceeded smoothly and that the resulting completed schools were well built was due to the careful supervision of each building by the engineers assigned to this work from the Construction Department of the Education Ministry. Their task was not easy. As we saw in Chapter Two, the activities of the Construction Department and its staff had until 1974 been confined to Kabul. There was thus no experience of working in remote places; no experience of the problems of travel, of procuring materials in remote villages, of negotiating with village contractors or of communicating with the main office in the Ministry in case of difficulty. The young engineer responsible for supervising the school illustrated in Plate 10 lived for long periods with the masons engaged for the work, in a broken-down, unused mud shed with three walls and cooked his rice in a pot on two stones over a wood fire.

Plate 11 illustrates a school in Badakshan, attractively sited among the poplar trees. This school takes at best two but usually three days to reach from

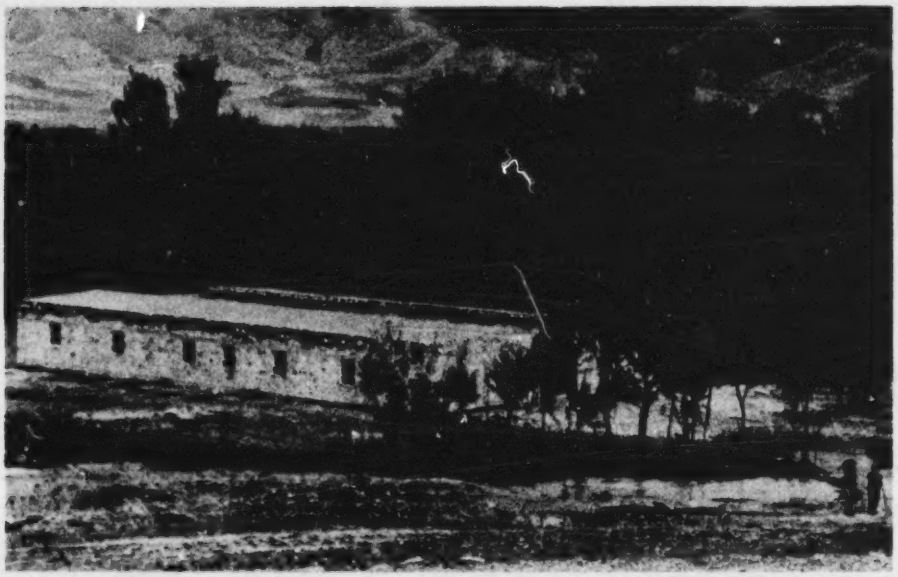


Plate 11. A prototype school in Badakshan Province

Kabul. The journey by road involves crossing a pass 3,800 metres high and a drive of several hours up an unpaved river bed. Some engineers were assigned to schools in even more inaccessible places that could be reached only by horse or by walking.

Difficult as it was to execute, the prototype programme showed very clearly:

a) that if the schools were to be well built, close supervision was necessary and,

b) that because of the difficulties of the terrain, the problems of housing engineers and the problems of control, it would be better to concentrate each year's programme in a specific province or in provinces adjacent to each other so that the supervisors would have a provincial base from which to visit the projects for which they were responsible.

The siting and size selected for the prototype schools also resulted in some interesting experiences which have been reflected in the main construction programme. An example of this aspect of the provision of a primary school in a rural area occurs in a Wardak village, which is reached after a half day's journey up an earth track in a valley[7] to the north of the main Kabul-Ghazni road. As is usual, a site was sought from the leader of the local community (a prosperous farmer), on which to construct the school, teachers' house and toilet (Plate 12). After much discussion, a fine cornfield beside the main track up the valley was given. The prototype school, house and toilet were duly constructed

7. Most of the population of the mountainous areas of Afghanistan live in river valleys between the bare hills on either side. The valley bed, usually at most a kilometre wide, is cultivated and the villages comprise houses that straggle out, often for several kilometres, on either side of the river. They are thus long, thin villages.

(Plate 13). The school was designed to house 170 children in six grades; in 1977, it housed more than 1,000 children. They are crowded into the classrooms, the courtyard, into the rooms of the teachers' house and sit on the ground around the building in two shifts, each of over 500.

Plate 12. Negotiations for a site for a prototype school, teachers' house and toilet in Wardak Province

Plate 13. A completed, prototype school in Wardak Province

The location and use of this particular prototype very clearly indicated the need for careful demographic studies and simple school mapping so that, where the demand for accommodation is high, the size of the school can be increased or more schools constructed. In a subsequent chapter, it is shown that the Wardak experience is by no means unique and gives good hope that the Government's aim to increase primary school enrolment to 45% during the Seven-Year Plan period (see Table 4) might well be achieved if it can be matched by the other inputs needed to provide effective primary education.

Table 4. School-age population (primary) and enrolment during the Seven-Year Plan period 1975-1982

Year	Plan Period						
	1976	1977	1978	1979	1980	1981	1982
a) School-age population in thousands	2,997	3,042	3,088	3,134	3,181	3,229	3,277
b) Planned enrolment in thousands	808	848	899	962	1,039	1,122	1,212
$\frac{b}{a} \times 100$	27%	28%	29%	31%	33%	35%	37%

Chapter Four

INITIAL ORGANIZATION FOR THE FIRST CONSTRUCTION PROGRAMME

The year 1974 saw the introduction by the Government of reforms in the system of education in the Republic. Figures 2 and 3 illustrate the changes. The significance of the reforms for the primary and village school construction programme was in the abolition of village schools and the establishment of eight grades of primary education uniformly, all over the country, in both rural and urban areas. This meant that the old village school required additional classrooms so that the children could continue their education up to grade VIII and that the design prepared for village schools, of which a number of prototypes had been built, was no longer valid. Moreover the prototype design for six-grade primary schools had to be adjusted to accommodate two more grades; that is grades VII and VIII. These grades would include in their curriculum a substantial element of work in practical arts. The accommodation needed for them would have to be tailored to meet this need through the provision of work benches and storage space for materials and simple tools and equipment.

Thus the drawings for the six-grade prototype schools were reviewed and an extra two practical teaching spaces added. The final design which formed the basis for the construction programme in 1976 was that shown in Figure 13.

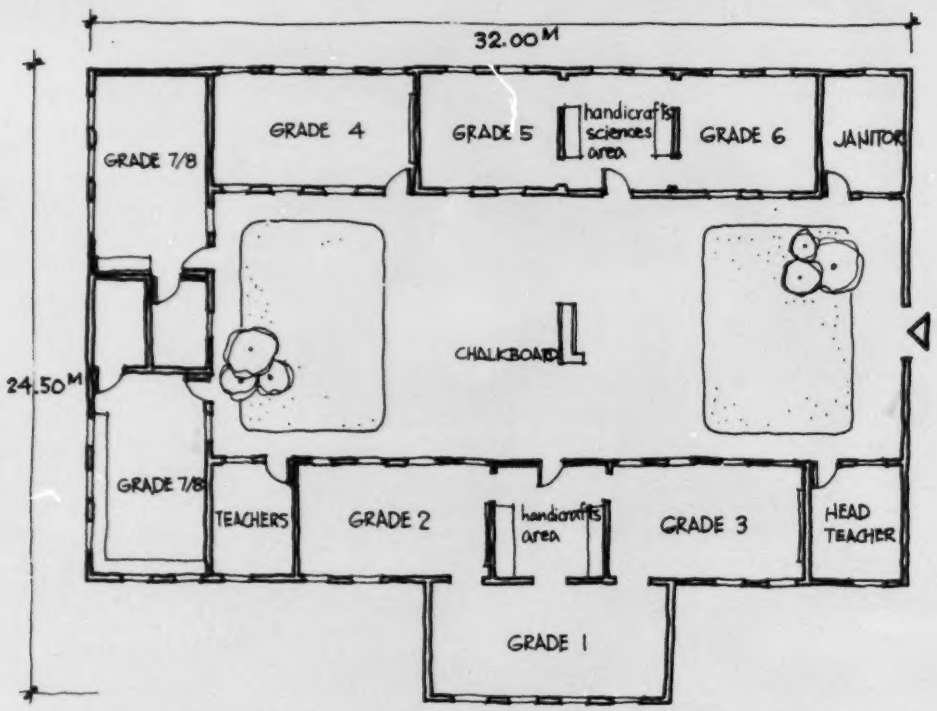


Figure 13. The initial prototype design for a six-grade school changed to accommodate the eight grades of primary education required by the educational reform of 1974

Another agency, the work of which subsequently became interlinked with the WFP project and which was to have a substantial impact on the capacity of the Construction Department to organize the supervision of its projects is the United States Agency for International Development (USAID).

In 1975, USAID was anxious to extend its assistance to the Government of the Republic of Afghanistan in primary school building. The Agency, having studied the new plans for the eight-classroom school, teacher's house and latrines, offered to finance the construction of 45 complete schools, comprising classrooms, houses and toilets in the earthquake-prone province of Parwan,[1] to the north of Kabul and in the provinces of Kandahar and Helmand. The total cost of the Parwan project was US $725,300 of which USAID contributed 85 per cent of the direct costs (labour, materials and transportation) and the Government contributed 15 per cent of the direct costs and all of the indirect costs (such as contractors' profit) and the land costs. Government also provided teachers, furniture and textbooks and an assurance that each school would be co-educational (not less than 15 per cent girls) and have an enrolment of at least 220 students.

Thus the stage was set for two projects - the 600-school WFP project and the 45-school project financed by USAID. The problem faced in the Construction Department was how to reorganize to deal, not with building in urban Kabul, but with building simultaneously in a number of provinces, many of which were very remote from the capital city.

The reorganization had to deal with a number of different aspects of the building process if it was to succeed. The first aspect to which attention had to be given was external to that of the Education Ministry and concerned payment for the building work. There were two components in this respect - payment for labour by food (the WFP contribution) and payment for materials (the Government contribution).

Payment for labour was organized as shown in Figure 14. Payment for materials and components was arranged as in Figure 15 which, it will be noted, represents a considerable simplification of the previous procedure (shown in Figure 5).

To accommodate these changed procedures as well as to supervise a large number of (small) projects in the provinces, the most important reorganization was of course internal - and in the Construction Department of the Education Ministry itself. Figure 4 shows the organization up to 1975. It comprised four functional sections, all reporting to the President of the Department through the Vice President.

The new organization, shown in Figure 16, is fundamentally different. The Department is now divided into two parts with the responsibility for administration, including financial matters, assigned to a Vice President while the three

1. Parwan Province is virtually at the centre of the Hindu Kush; the minimum elevation in the province is 1,500 metres. More than half the area of the province, however, is over 2,700 metres high with some of the passes at more than 3,000 metres and two peaks more than 5,200 metres above mean sea level.

technical aspects of the Department's responsibility - maintenance, field supervision of projects and technical direction of projects - become the responsibility of a second Vice President.

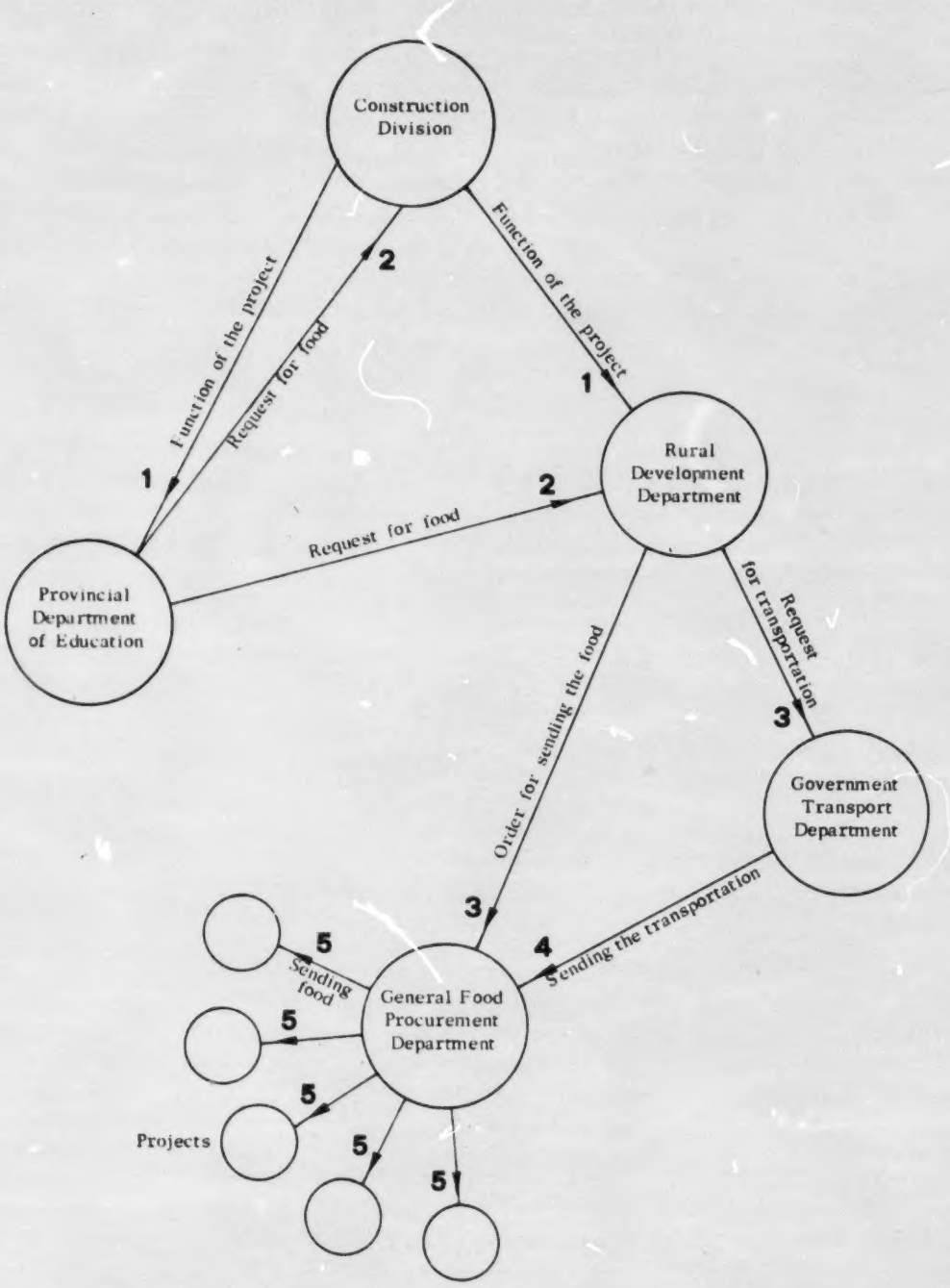


Figure 14. Flow chart showing organization for distribution of food to W.F.P.-supported school building projects

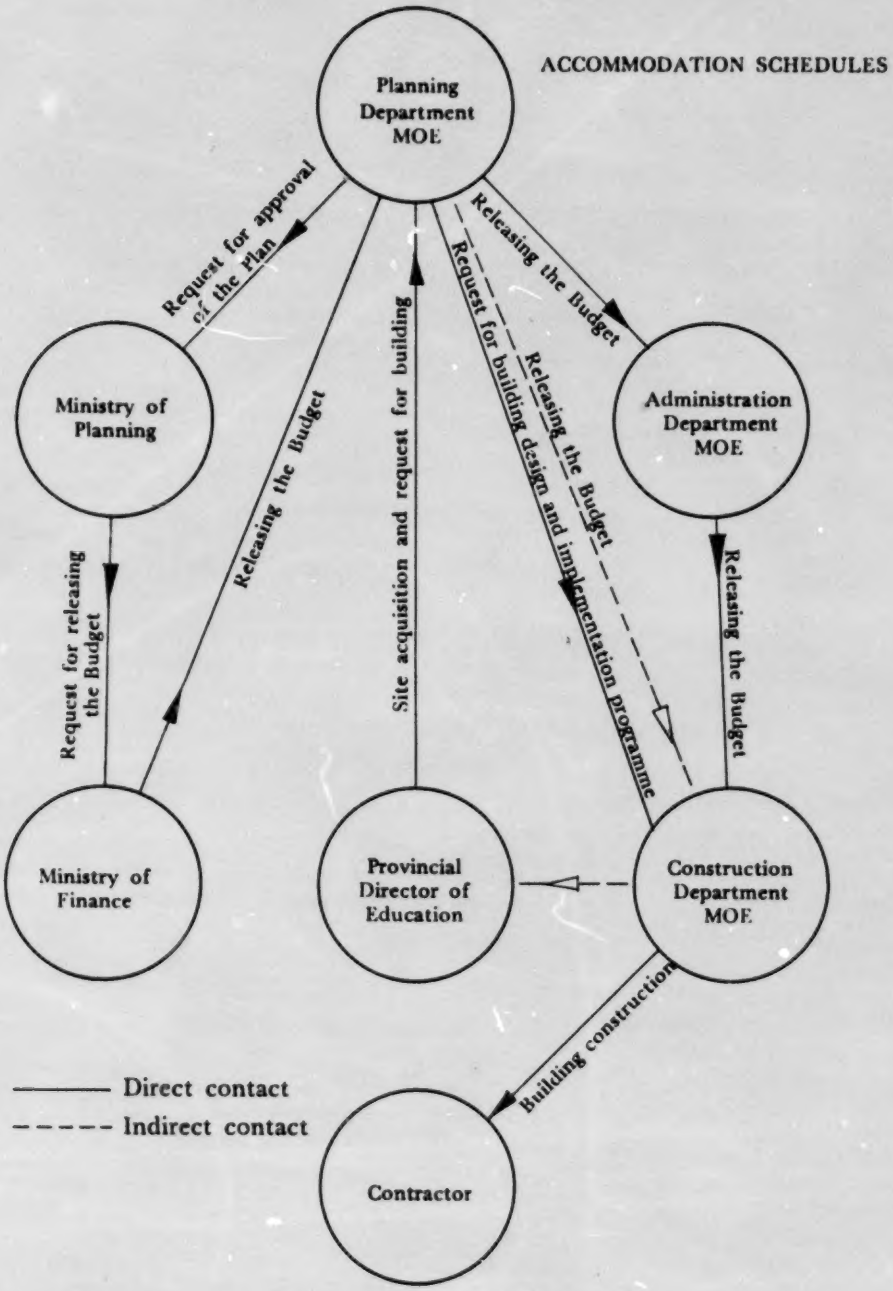


Figure 15. Flow chart showing organization for distribution of money for materials for W.F.P.-supported school building projects

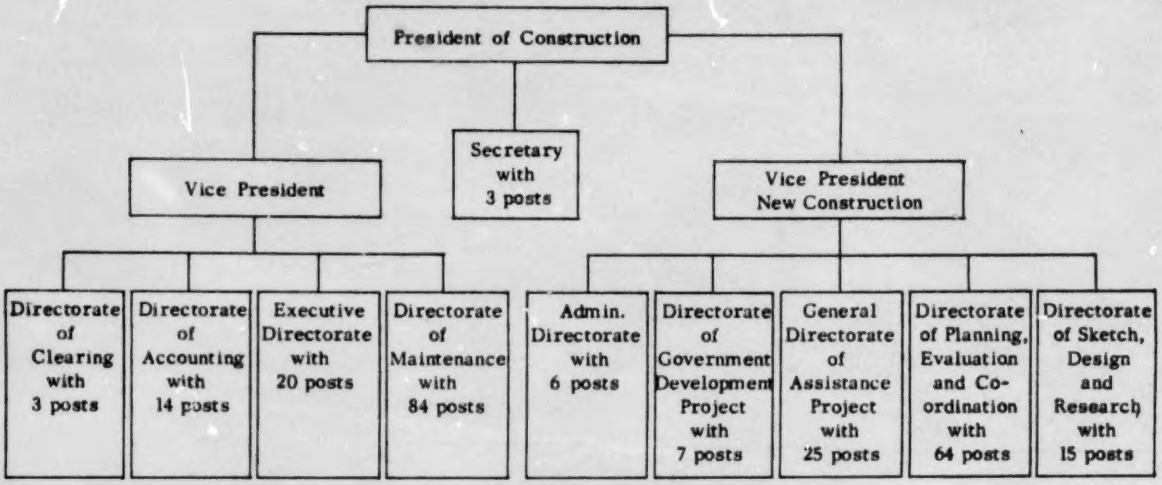

President of Construction
Secretary with 3 posts
Vice President
Vice President New Construction
Directorate of Clearing with 3 posts
Directorate of Accounting with 14 posts
Executive Directorate with 20 posts
Directorate of Maintenance with 84 posts
Admin. Directorate with 6 posts
Directorate of Government Development Project with 7 posts
General Directorate of Assistance Project with 25 posts
Directorate of Planning, Evaluation and Co-ordination with 64 posts
Directorate of Sketch, Design and Research with 15 posts

Figure 16. Reorganization of the Construction Department in March 1976

Under the new organizational pattern, the President was freed from the need to attend to matters of detail and was able to concentrate on policy, organizational matters and general control.

By June 1976, the tentative reorganization of March had been greatly developed. Maintenance had been moved to become the responsibility of the Vice-President for Administration and the Vice-President for New Construction had a unit strengthened by the addition of a small administrative Directorate, a Planning Directorate and a Design and Research Directorate. The organization at June 1976 is shown in Figure 17, and the functions assigned to each Directorate are described in Annex I.

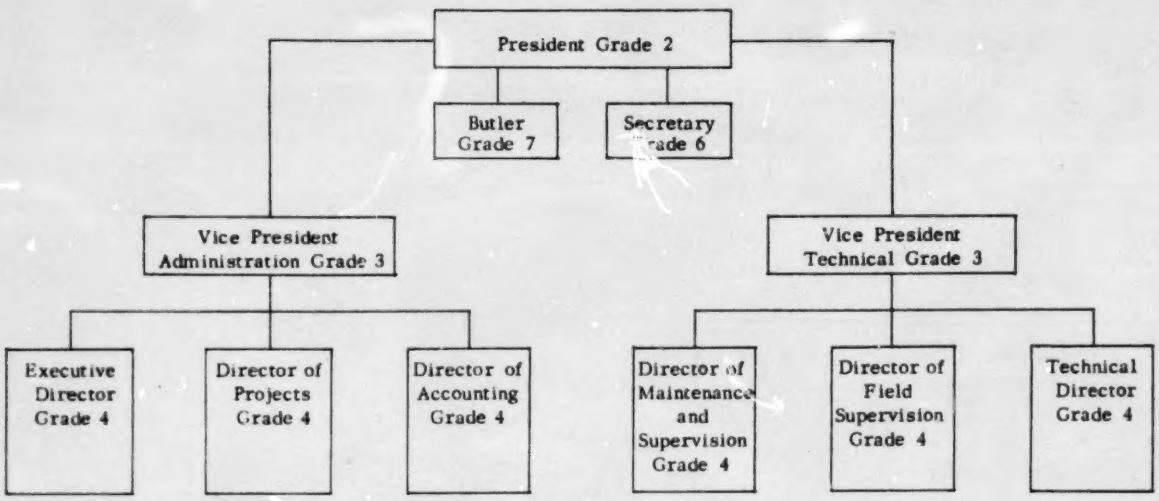

President Grade 2
Butler Grade 7
Secretary Grade 6
Vice President Administration Grade 3
Vice President Technical Grade 3
Executive Director Grade 4
Director of Projects Grade 4
Director of Accounting Grade 4
Director of Maintenance and Supervision Grade 4
Director of Field Supervision Grade 4
Technical Director Grade 4

Figure 17. Development of the new pattern of organization - June 1976

Despite all these essential changes, it was necessary to deal concurrently with the details of implementing the WFP-supported programme of 300 units which was to begin in 1976. Most important was the need to match the flow of food and money with supplies of materials that were produced at central points and had to be transported to the school sites. Thus cement had to be distributed from the cement factories to the sites (Figure 18), doors and windows had to be ordered and, when ready, moved from the joinery factories to the sites (Figure 19) and, finally, the plastic membrane for the roofs and glass for windows had to be procured in Kabul for distribution to the provinces where construction was to be initiated (Figure 20).

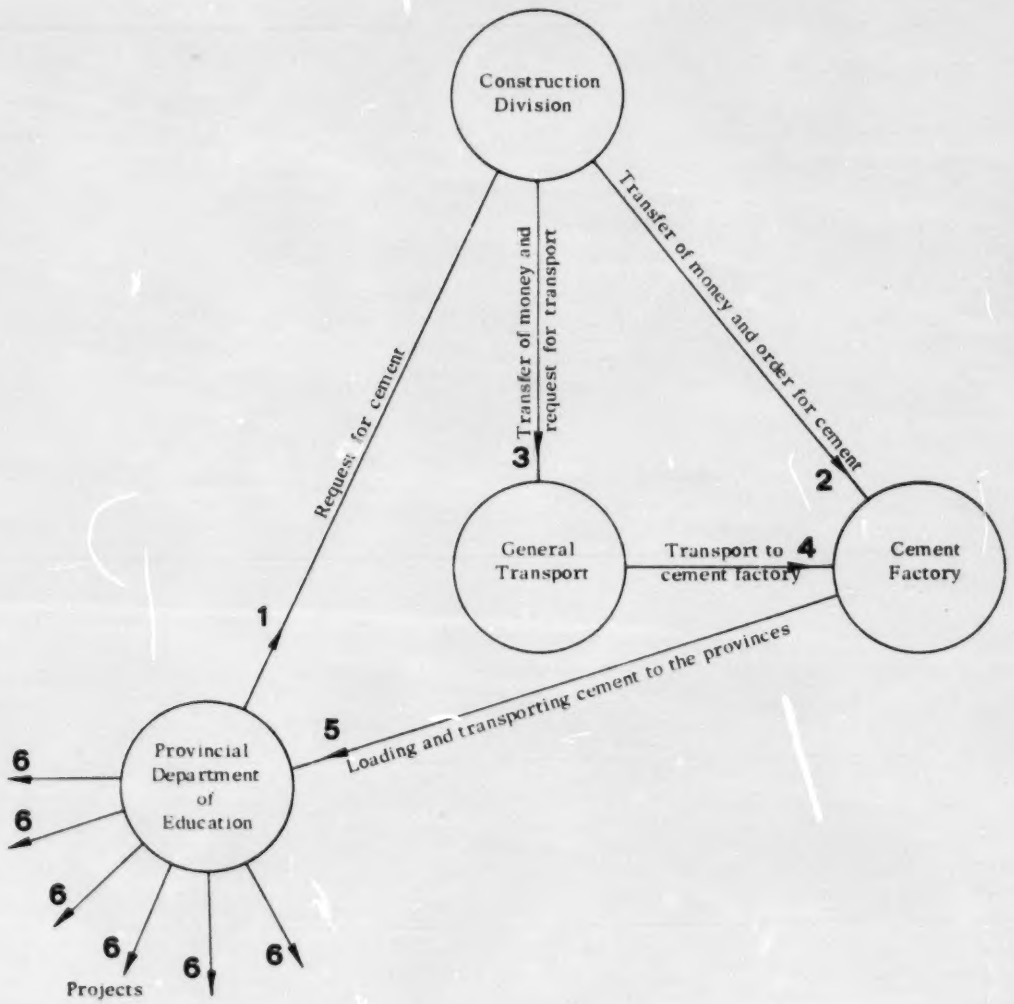


Figure 18. Flow chart showing organization of cement procurement and distribution to the W.F.P.-supported projects

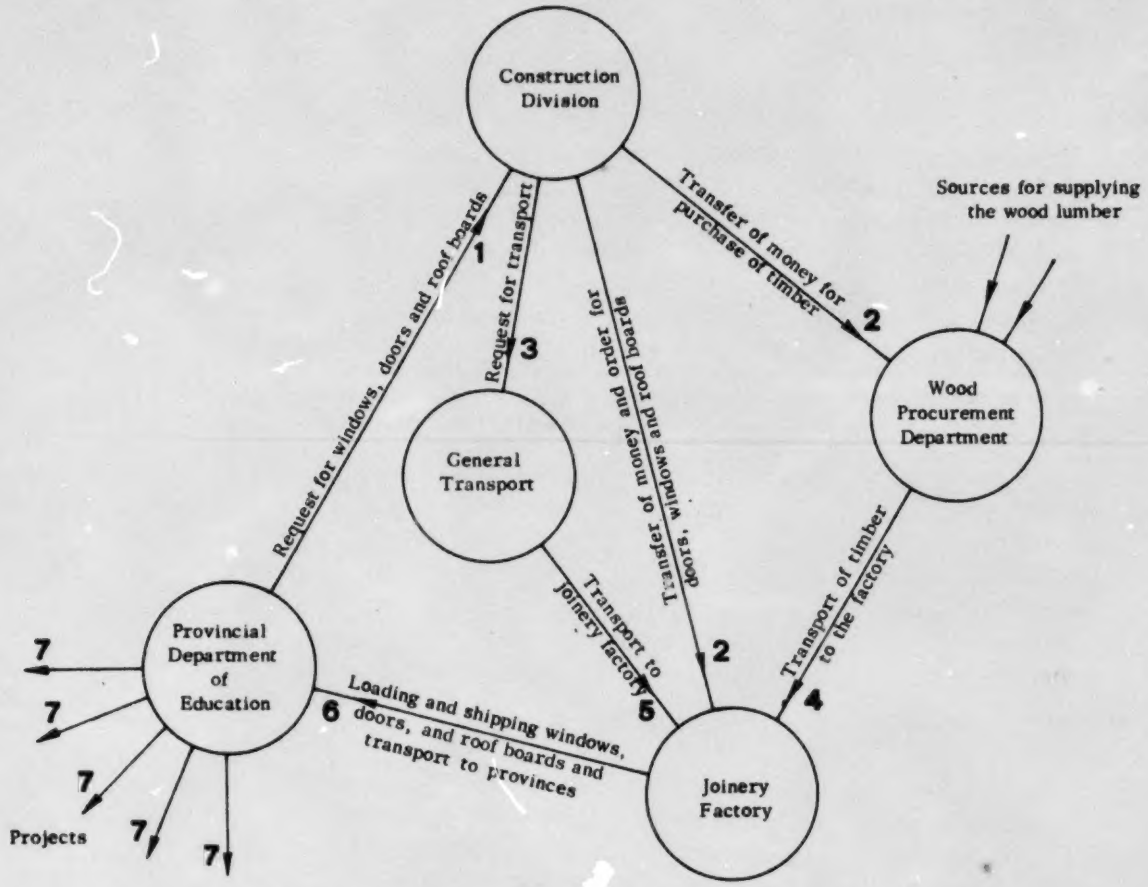


Figure 19. Flow chart showing organization and procurement and distribution of windows, doors and roof boards to the W.F.P.-supported projects

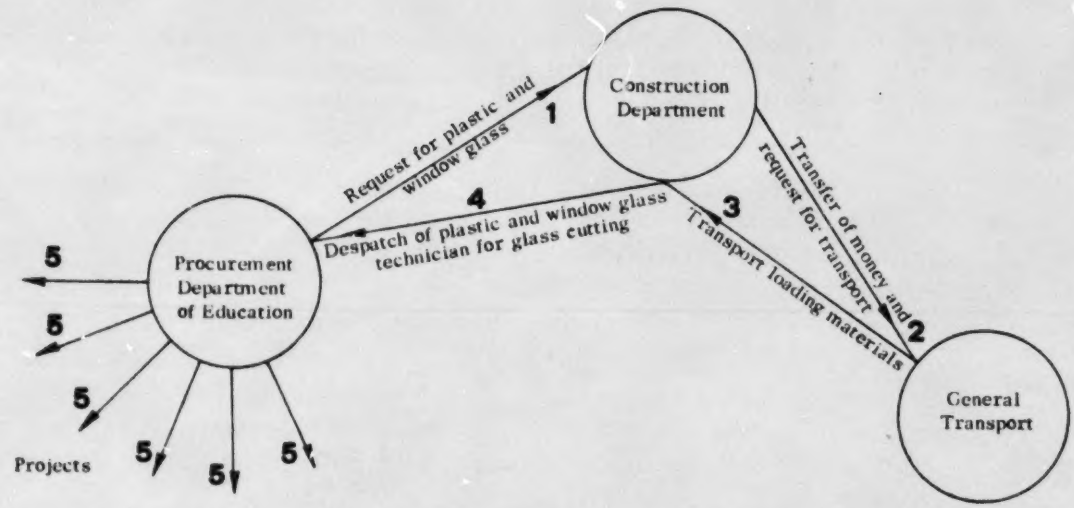


Figure 20. Flow chart showing organization of procurement and distribution of plastic sheet and window glass to the W.F.P.-supported projects

Meanwhile, sites for construction had been selected in eight contiguous provinces as shown in Table 5.

Table 5. Distribution of new buildings by provinces in the 1976 construction season for the WFP-supported project

Building provided	Province								Totals
	Logar	Badakhshan	Paktia	Laghman	Wordak	Kabul	Nengarhar	Ghazni	
Teachers' house	3	11	18	8	21	19	30	37	147
4 classrooms*	0	6	1	0	12	4	1	11	35
8-classroom school and toilet	9	8	17	13	7	24	31	29	138

* To provide additional accommodation for schools that were incomplete, overcrowded or which, as former village schools, had insufficient classrooms.

In addition, as mentioned above, 30 sites were selected for similar schools, houses and latrines under the USAID-supported project. The primary-school construction programme was thus in a position to start with money disbursed, sites selected and the materials that were not available locally on call from the factories in other parts of the country. The only matter that required attention was that of responsibility for construction at the site and it was in this respect that the WFP and the USAID-supported projects differed.

The WFP-supported project organization can best be described first. The scheme was launched to the public and to the Provincial Education Authorities in the winter of 1975/76 in two ways. First, the President of Construction in radio broadcasts told the people about the plan and enlisted their support in donation of land for sites and in assistance in construction and supply of local materials such as stone, mud for sun-dried bricks and for roofs, and poplar poles for roofs. The radio talks did much to inform the public about the project and to mobilize public support, especially in remote areas with which it would otherwise have been difficult to communicate.

Second, the President of Construction and the President of the Rural Development Department arranged three meetings at which the Governors and sub-Governors of Provinces, the General Directors of Education and the General Directors of the Rural Development Department were fully briefed about the project - the arrangements for distribution of food, money and materials.

This activity was followed up by the education authority at the local level. Construction on each of the selected sites was to be the responsibility of a small group comprising the head teacher, a representative of the village people and a representative of the education authority whose duty was to arrange for purchases of local materials and payment for labour with food, and to request items such as cement and joinery when they were needed.

Under the terms of the agreement, the USAID schools, of which 45 were to be constructed in Parwan Province were to be built by contractors employed by the Government and selected using normal procedures after submission of competitive tenders.

Thus, although the buildings constructed under both WFP and USAID-supported schemes were identical in design, the approaches to the organization of their construction were fundamentally different.

Chapter Five

MANAGEMENT AND EVALUATION OF THE PROJECTS IN 1976

Work started in the spring of 1976 on 320 buildings as part of the WFP programme (Table 5) and on 90 buildings (school, house, toilet) on 30 sites in Parwan Province as part of the USAID-supported programme.

The documents supplied to all the various sites comprised small books of 40 pages, one edition for mud brick, another for burned brick and a third for stone-walled buildings depending on local availability of material. Each book, printed on A-4 size paper, contained the plans, elevations, sections and details for the school building, teachers' house and latrine, followed by the specifications and concluding with a list of quantities of materials required.

The books represented a great improvement over the former practice of supplying large, unwieldy drawings and separate specifications. Every responsible person at every site was now provided with a neat book of instructions and, as the year passed these books, increasingly worn, were much in evidence and much used.

The differences in management of the WFP- and USAID-supported schemes were fundamental. The Parwan buildings were constructed by contractors. The terms of the contracts required the contractors to supply all labour and materials and thus the role of the Construction Department in the Education Ministry was confined to that of periodical supervision of construction.

Initially the supervision of the Parwan buildings was undertaken by two qualified civil engineers with six qualified technicians, each responsible for five sites. Subsequently, as the year drew on, it was found that six technicians were not enough and the cadre was then increased to one for every site. There were three outcomes from this arrangement. First, all of the buildings on all 30 sites were completed during the building season by about October. Second, the quality of construction work was very high indeed, as will be evident from Plate 14. Third, the technicians became well trained in their work and were thus ready for the next construction season.

By contrast with the Parwan construction programme, the WFP-supported programme was very much more complex and consequently made slightly slower, although very good progress.

The progress with the larger programme hinged round two problems. First was material supply. There was, in this respect, no difficulty in the supply of cement, plastic sheet for roofs and glass for windows. Considerable difficulty was experienced, however, in the supply of doors, windows and roof

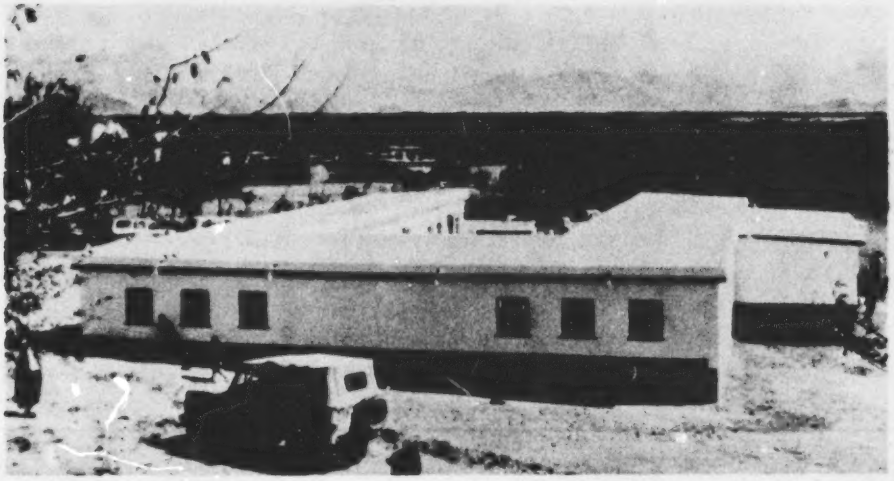


Plate 14. Example of completed school in Parwan Province, built under the USAID-supported project

boarding. The reason for the difficulty was not far to seek. By Government regulation, all joinery for Government buildings, including schools, had to be manufactured by the Government Joinery Factory. The rate at which doors and windows were required if the 320 buildings were to be completed in the summer building season of 1976, was about 2,000 items per month. The rate of production of the factory was about 200 items per month; just one tenth of the requirement. In consequence, many schools were finished or almost finished in the summer of 1976 but lacked essential doors and windows[1] (Plate 15).

Plate 15. Many buildings were completed but, due to low capacity in the joinery factory, lacked doors and windows.

1. For those unfamiliar with building practice in Afghanistan, it should be mentioned that plugs are inserted in joints of wall openings and doors and windows fixed *after* rather than before the walls are constructed (see plate 15).

The second problem was that of supervision. Although the staff of the Construction Department had sufficient engineers to allocate one or two to each province, there were not enough to allocate one to each of the several hundred sites at which construction was planned to start. As a temporary measure, a number of students who had recently completed grade XII in the Afghan Institute of Technology or at Mechanical Schools in Kabul, Kandahar and Kaptia, were recruited as supervisors, given a short period of training and sent out, several to each province, to do what they could under the guidance of the Construction Department Engineers to help the work forward. They were assisted by well-experienced masons recruited from Kabul Province and sent with them to the sites to supervise construction. This was arranged because it was difficult to recruit skilled supervisors with a technical school background. It was evident, however, that considerable reliance had to be placed on the local craftsmen in the community to carry out the work as best they could. This, of course, was compatible with the design of the buildings themselves which was based on local construction methods.

Not surprisingly, where the design included details which were not part of local practice, as for example, the earthquake-resisting reinforced-concrete ring beams and the bond stones to tie the outer 'skins' of the stone walls together, it proved impossible, due to the lack of full-time supervisors, to get these features included in the buildings. This is in contract with the Unicef-financed prototypes, mentioned in an earlier chapter, and the Parwan schools, all of which were supervised, full-time, by trained engineers and technicians.

By the end of the construction season in October-November 1976, most of WFP-supported schools were nearing completion, although many were without doors and windows. Nearly all had been completed by the spring of 1977 (Plate 16).

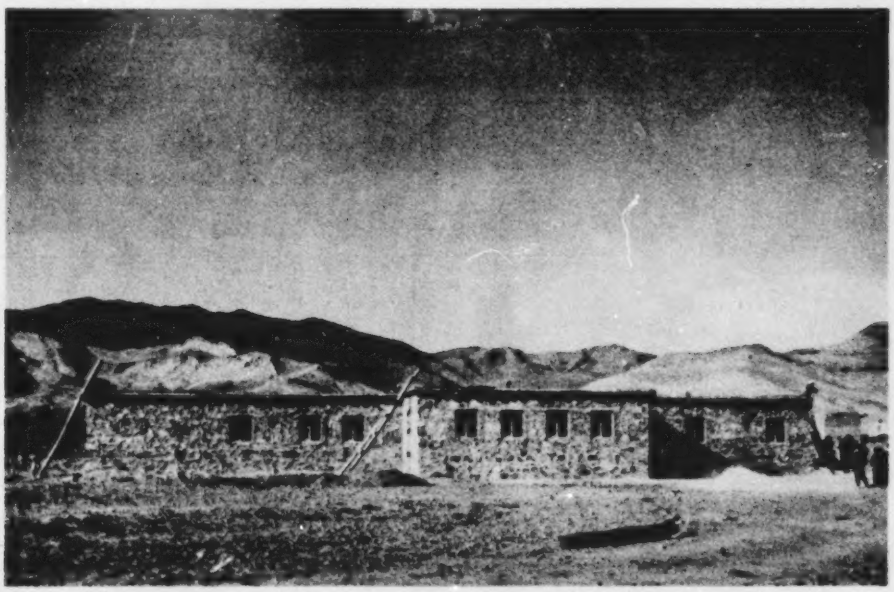


Plate 16. Example of school built under the WFP-supported programme and nearing completion at the end of the 1976 construction season

The experience of the 1976 construction season and of the winter that followed were of very considerable value and allowed a number of conclusions to be drawn that were to lead to changes in designs of the buildings, to changes in government regulations, to training programmes and, perhaps most important of all, to yet further changes in the organization of the Construction Department itself.

As far as the design of schools was concerned, it was evident that the arrangement of the school buildings would have to revert from that of the U-shaped block to the two separate or four separate blocks of the prototype design. The reason for this was that most sites sloped and the effect of a continuous level building was to increase either the cost of excavation for foundations or the cost of walls (Plate 17 and Figure 21). In modifying the design, opportunity was taken to discuss it with educators: early in 1977 a modified design was produced in which the experiences of builders and educators were incorporated (Figure 22). Similarly, design modifications were made to the detailed arrangements inside the teachers' house.

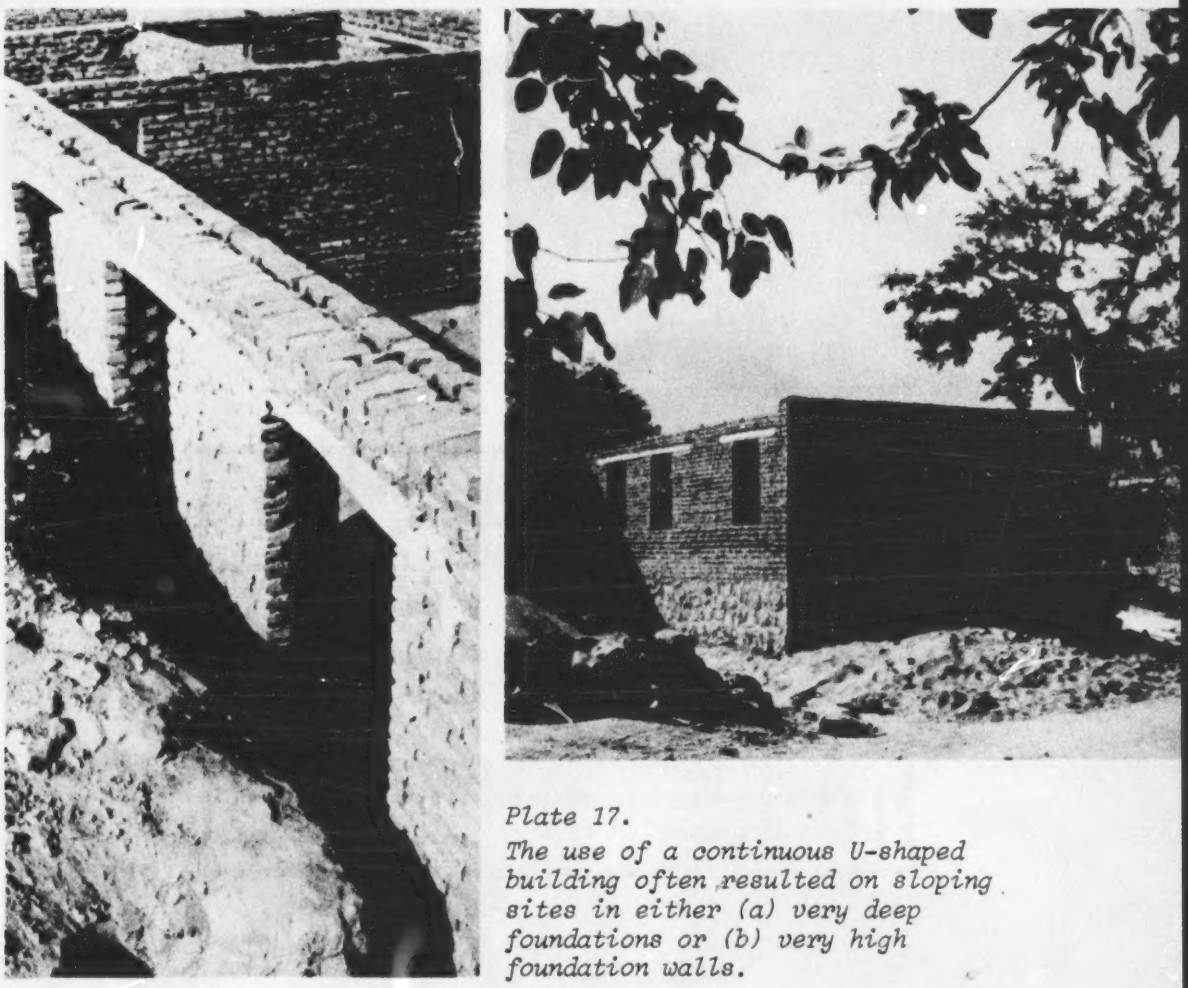
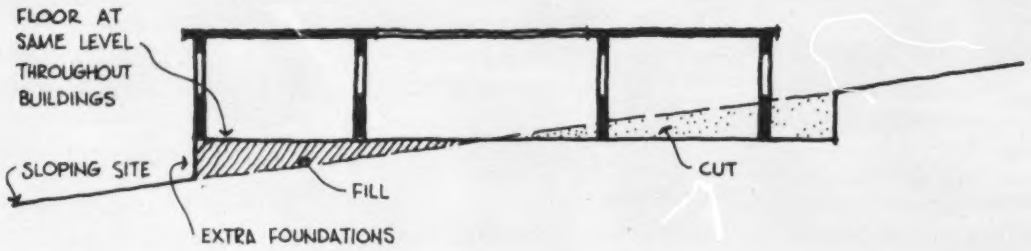


Plate 17.
The use of a continuous U-shaped building often resulted on sloping sites in either (a) very deep foundations or (b) very high foundation walls.



U-SHAPED BUILDING

BUILDINGS IN SEPARATE PARTS
AVOIDING CUT AND FILL

Figure 21. The advantages of a building in parts and able to accommodate to sloping sites, as compared with the difficulties of a U-shaped building comprising one unit

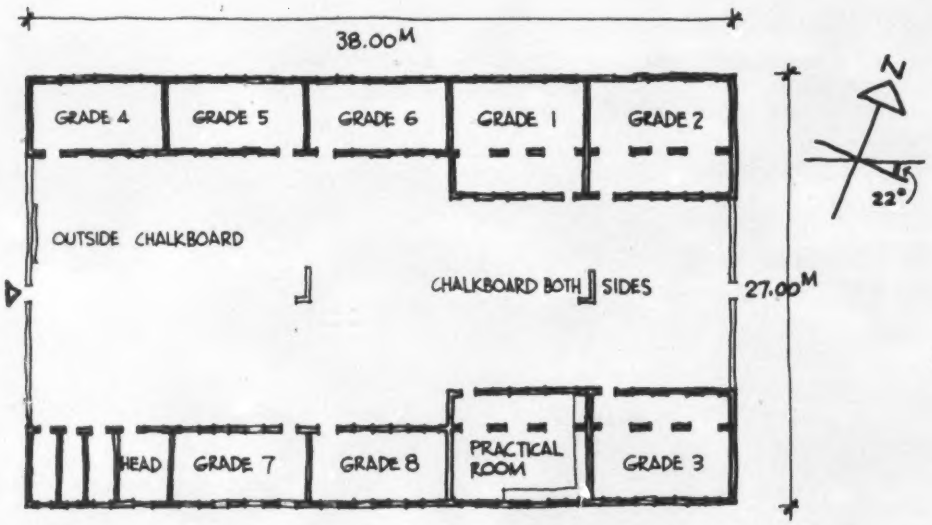


Figure 22. The modified primary school design for the 1977 programme

The construction of the roof of the buildings had also to be modified in the 1977 programme. Three departures from the traditional practice of roof construction had resulted in minor leaks in the roof of some buildings during the 1976-77 winter rains and melting snows.

First, the roof edge detail shown in the original design was modified to a non-traditional form in all the Parwan buildings and in many of the WFP-supported buildings. Normally the detail on the lower side of the mud roof is that of a dripping eaves, off which the water runs freely. The change made was to put a small parapet wall right round the edge of the roof with small rain water outlets at which the water was supposed to collect and run out (Figure 23 and Plate 18).

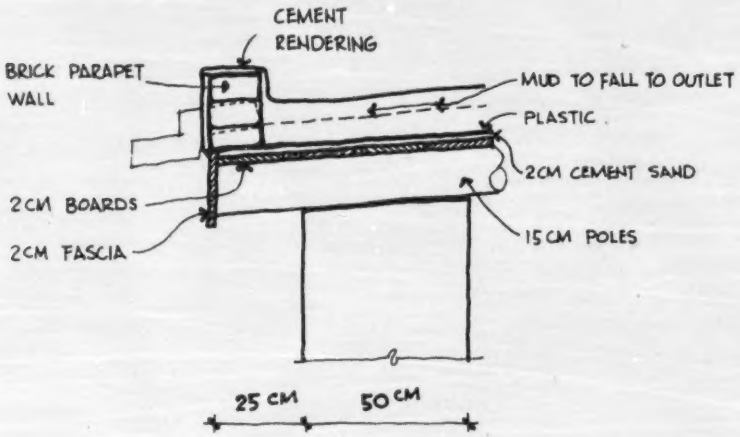


Figure 23. Details at the eaves of the mud roof.

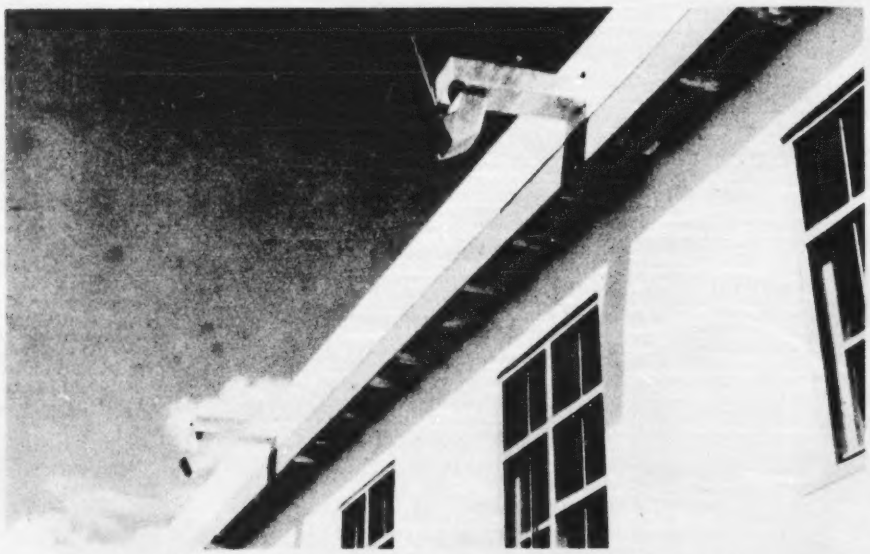


Plate 18. The cornice wall with outlet looks attractive but it prevents water running freely off the roof and leads to leaks.

Such a detail, which is neat in appearance, would be practical if the roof surface were of some impermeable material such as concrete, metal or bituminized felt. As proved by events, however, the mud roof was permeable and hence the parapet and outlets were unpracticable with the local roofing material - mud. There was thus an obvious need to return to the original, traditional detail as shown in the drawings for the 1977 programme.

Second, the roof design incorporates below the mud a thin plastic membrane to ensure that, if water penetrates the mud, it goes no farther. The joints between the plastic sheets should have been similar to those used for sheet-metal roofs. Instead, it was later decided to join one plastic sheet to the next with adhesives and this led to leaks. Finally, an interesting observation was made on the quality of the mud. A villager making a mud roof for his own house will only use a certain type of carefully selected earth which is put in pits with chopped straw and trampled and turned intermittently for at least two weeks during which time the mixture appears to mature. It is then used to form the flat roof. In the Parwan (USAID-supported) projects which, it will be recalled, were built by contractors, it seems likely that the same care a villager takes in selecting, mixing, maturing and placing the mud was not taken by the contractor. In some roofs the mud selected was found to be sandy. Probably unfamiliar with this village skill, some of the supervisors were unable to control the quality of what was being done and the result in a few of the schools was leaking roofs. By contrast, there are as yet few reports of leaking in the WFP-supported projects, probably because the workers employed in constructing the roofs, being villagers, exercised the same care as they would have done on their own houses.

The lesson from these three experiences is that, if local practices are to be used in construction, they must only be modified with great caution, and preferably in consultation with those responsible for doing the work.

Another experience - that of the need for a much greater source of supply of joinery than can be expected from a single government factory - has led to a modification of the Government regulations.[2] The Construction Department is now authorized to obtain joinery and roof boarding from other privately owned factories. This practice has led to a marked speeding up of delivery of doors and windows to sites.

The need for supervision by trained technicians was already known and the Parwan project reinforced the Construction Departments argument in this respect. Thus, in the winter of 1976-77, when building was impossible due to rain, frost and snow, the opportunity was taken to recruit and train a cadre of supervisors for the 1977 building season.

Two final comments complete this chapter. First, the comparative costs of the USAID- and WFP-supported programmes are given in Table 6. The figures are not strictly comparable, as schools in the WFP-supported programme had no reinforced concrete earthquake rings. Had these been included, then the cost of the eight-classroom school would have been increased by 77,126 Afghanis.

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2. The Government factory is charged with providing *All* government joinery requirements and produces joinery of very high quality indeed.

Table 6. Unit costs of the USAID- and WFP-supported programmes in Afghanis (Afs)

Material	Eight-classroom school	Teachers' house	Toilet
USAID-supported			
Brick	Afs 822,244	324,415	89,328
Stone	Afs 894,531	382,642	86,855
WFP-supported			
Brick	Afs 421,526*	146,749	42,599
Stone	Afs 403,515*	136,643	43,571
Mud	Afs 348,958	117,569	34,964
MOE previous design for urban areas (1975)	Afs 936,110		

* Add Afs 77,126 for direct comparison with USAID-supported costs.

Second, and one of the most important points about the entire programme, is the effect that it appears to have had on enrolment. A sample of nine schools from Parwan province illustrates the point. Before these nine new schools were built, there were 4,981 students enrolled. The enrolment in the new buildings is now 5,946, and with 370 children still in the old schools (which were all houses rented by Government to serve as schools), the increase in enrolment to a total of 6,316 is 26.8 per cent.

ANNEX

Functions of the Directorates in the Department of Construction
based on the June 1976 re-organization

UNDER THE VICE-PRESIDENT FOR ADMINISTRATION - total staff establishment of 125 comprising:

Directorate of Clearing

On the assumption of office by the present President of Construction in 1973, it was found that unsettled accounts, in some cases going back 30 years, formed part of his responsibilities. The accounts all involved old building contracts, some of which were uncompleted and abandoned, some of which concerned bankrupt contractors and some of which had never been finally balanced. Three staff members under the personal supervision of the Vice President were assigned to clear up these accounts. Once the work is finished, this small Directorate will have no further function.

Directorate of Accounting

Divided into two sections - one concerned with money, the other with materials - this Directorate is responsible for:

1. Settlement of final accounts with contractors;
2. Maintenance of all accounts for the Department;
3. Maintenance of inventories of equipment and of all Ministry of Education furniture in Kabul city, including furniture in the Ministry;
4. Organizing the despatch of materials to WFP-supported projects in the provinces.

Executive Directorate

Divided into three sections for:

1. Real estate - charged with responsibility for records on school buildings and other Ministry of Education properties;
2. Service - radio and newspaper announcements for tenders of value over about US $1,000; preparation of contracts for the purchase of materials;
3. Office management - responsible for internal office management procedures.

Directorate of Maintenance

This Directorate was, in 1976, responsible for the maintenance of all schools in Kabul city as well as for the building of the Education Ministry itself. In 1977, this responsibility was extended to include all schools in the provinces.

UNDER THE VICE-PRESIDENT FOR NEW CONSTRUCTION - total staff establishment of 122 comprising:

Administrative Directorate

Responsible for:

a) Preparation of contract documents for building tenders; receipt and analysis of tenders and submission to Tender Committee for selection of successful contractor;

b) Arrangements for signing of building contracts, fixing dates for commencement of work, checking of bills and accounts from contractors and certifying for payment by Directorate of Accounting.

Directorate of Government Development Programmes

Responsible for construction still controlled by the Public Works Department, namely lycée, vocational and primary schools on which work was started in the pre-1974 period and still continue.

General Directorate for Assistance Projects

Responsible for participation in negotiations for projects assisted by foreign aid, whether bi-lateral or multi-lateral and for arranging agreements with aid-giving agencies. Responsible also for reports to aid-giving agencies such as IDA, USAID and WFP, as appropriate.

Directorate of Planning, Evaluation and Co-ordination

This Directorate is divided into two sections - planning and evaluation.

1. The Planning and Co-ordination Section is responsible for preparing the annual financial estimates for all projects which are the responsibility of the Construction Department. This involves receipt of plans and budget estimates for the following year's work from all of the Directorates in the Department and integrating them in one plan document for submission to the President of Construction.

2. The Evaluation Section is responsible for the allocation of engineers and technicians to projects for supervision and for the collection of data for evaluation.

Note: The financial plan in (1), above is subsequently sent to the Ministry of Planning. After discussion, amendment and approval there it is passed to the Ministry of Finance which releases funds to the President of Administration in the Ministry of Education. Subsequently, payments may be made to the Provincial Educational Directorates or to construction companies and materials suppliers or receipt of requests from the Directorate of Accounts and the Directorate of Government Development Programmes.

Directorate of Design and Research

Responsible for the production of building designs, working drawings, specifications and estimates; responsible also for site surveys and site planning for larger projects. The Directorate undertakes research and studies in connection with building design.

THE AUTHOR:

Mr. Fazal Ahmad, President of the Construction Department, Ministry of Education, Republic of Afghanistan, is not only the author of this report, but also the person responsible for the substantial changes in organization and in the design and construction of buildings that it describes.

A civil engineer, Mr. Fazal Ahmad received his basic engineering education in Afghanistan and his post-graduate degree in engineering from a Canadian University.